

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOHANNES WILHELMUS MARIA SONNEMANS
AND SONJA EIJSBOUTS

Appeal 2006-2691
Application 09/942,830
Technology Center 1700

Decided: January 11, 2007

Before EDWARD C. KIMLIN, THOMAS A. WALTZ, and
CATHERINE Q. TIMM, Administrative Patent Judges.

WALTZ, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on an appeal from the Primary Examiner's final rejection of claims 1, 7 through 12, and 18 through 28, which are the only claims pending in this application. We have jurisdiction pursuant to 35 U.S.C. § 134.

According to Appellants, the invention is directed to an ultra-deep hydrodesulfurization (HDS) process for reducing the sulfur content in a hydrocarbon feedstock from 150 to 500 ppm to a final sulfur content of less than about 50 ppm by contacting the feedstock with a specified catalyst and sulfur-containing organic additive at certain process conditions (Br. 3-4).

Independent claim 1 is illustrative of the invention and is reproduced below:

1. An ultra-deep hydrodesulfurization process for reducing the content of sulfur compounds comprising alkylated benzothiophenes in a hydrocarbon feedstock having an initial boiling point of not less than about 1000°C and a 95% boiling point of about 4500°C or less and a sulfur content between about 150 ppm and about 500 ppm to a sulfur content of less than [sic, than] about 50 ppm, comprising contacting said feedstock with a catalyst comprising a Group VIB metal component, a Group VIII metal component selected from the group consisting of nickel, cobalt and iron, and an S-containing organic additive comprising a mercaptocarboxylic acid represented by the general formula HS-R₁-COOR, wherein R₁ stands for a divalent hydrocarbon group with 1 to about 10 carbon atoms and R stands for a hydrogen atom, an alkali metal, an alkaline earth metal, ammonium, or a linear or branched alkyl group having 1 to about 10 carbon atoms, at a temperature from about 200 to about 450°C, a hydrogen partial pressure from about 5 to about 200 bar, a liquid hourly space velocity from about 0.1 to about 10 vol./vol.h and an H₂/oil ratio from about 50 to about 2000 N1/1, thereby decomposing said sulfur compounds.

The Examiner has relied upon the following references as evidence of obviousness:

Takahashi (EP '211)	EP 0 289 211	Nov. 02, 1988
Takahashi	US 4,845,068	Jul. 04, 1989
Takahashi (EP '295)	EP 0 357 295	Mar. 07, 1990
Hatanaka	US 6,251,263 B1	Jun. 26, 2001

Claims 1, 7-12, and 18-28 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Hatanaka in view of any one of Takahashi or EP '211 or EP '295 (Answer 3).¹ We AFFIRM these rejections on appeal essentially for the reasons stated in the Answer, as well as those reasons set forth below.

OPINION

The Examiner finds that Hatanaka discloses a HDS process where a hydrocarbon feedstock is contacted with a catalyst in reaction zones to produce a final product with a sulfur content of about 1 to 50 ppm, and the catalyst and reaction conditions are the same or overlap with those recited in the claims on appeal (Answer 3). The Examiner recognizes that Hatanaka does not specifically disclose the claimed amount of sulfur in the hydrocarbon feedstock (*id.*). The Examiner concludes that it would have been obvious to use a feedstock with any amount of sulfur greater than about 50 ppm with the expectation of successful results (Answer 3-4).

The Examiner also recognizes that Hatanaka does not disclose or suggest the claimed sulfur-containing organic additive (Answer 4). Therefore, the Examiner applies the three Takahashi references (Takahashi, EP '211, and EP '295) for the teaching of using a sulfur-containing organic additive with the same catalysts as taught by Hatanaka in a HDS process to enhance the catalyst activities and avoid presulfurization and heat-treating of the catalyst (Answer 4). From these findings, the Examiner concludes that it would have been obvious to one of ordinary skill in this art at the time of the

¹ The rejection of claims 1, 7-12, and 18-28 under § 103(a) over Baird (US 5,935,420) in view of any one of Takahashi, EP '211, or EP '295 has been withdrawn by the Examiner. (Answer 3).

invention to use a sulfur-containing organic additive with the catalysts in the HDS process of Hatanaka for the advantages taught by the Takahashi references (*id.*). We agree.

Appellants argue that the “crux of this appeal” is the “fundamental difference” between the ultra-deep HDS process as compared to conventional HDS (Br. 5). Appellants submit that conventional HDS reduces the sulfur content of a hydrocarbon feedstock to values of about 1500 ppm, removing compounds such as sulfides, disulfides, thiophenes, and benzothiophenes, while ultra-deep HDS reduces the sulfur content to less than about 50 ppm, primarily removing alkylated benzothiophenes (Br. 5-6). Appellants argue that the reacting compounds and reaction mechanism for the two processes are so different that the catalysts one skilled in the art would expect to provide good results in a conventional HDS do not perform as well in ultra-deep HDS (Br. 6). Appellants agree with the Examiner that Hatanaka is directed to ultra-deep HDS, with the sulfur content reduced to as low as 30 ppm (Br. 6, citing Hatanaka, Example 3). However, Appellants argue that all the Takahashi references are directed to similar conventional HDS processes (Br. 6-7), and thus there would be no teaching, suggestion, or motivation to combine the disclosures of the references (Br. 7). Appellants also argue that Hatanaka is concerned with three reaction zones to finally reduce the sulfur content to less than 50 ppm, while the Takahashi references are directed to HDS processes similar to that of the first reaction zone of Hatanaka (Br. 7).

Appellants’ arguments are not persuasive. In contrast to Appellants’ arguments, Appellants disclose that “[i]n the context of the present

specification the term ultra-deep HDS means the reduction of the sulfur content of a hydrocarbon feedstock to a value of less than about 200 ppm" (Specification 2: 4-5; *see also* 2:27 and 5:18-22). Hatanaka teaches three reaction zones with appropriate catalysts and conditions, where in the first zone sulfur compounds other than 4-methyl and 4,6-dimethyl dibenzothiophenes are removed, in the second zone the 4-methyl and 4,6-dimethyl benzothiophenes are removed, and in the third zone the thiol and sulfide by-products of the second zone are removed to reach the final desired sulfur content of from 1 to 50 ppm (Hatanaka, cols. 3-5). Hatanaka, in the second zone, uses "the best catalyst for each hydrogenation zone," i.e., nickel and tungsten, to remove 4-methyl and 4,6-dimethyl benzothiophenes and effect ultra-deep HDS (Hatanaka 5:27-47 and 61-67), while Appellants claim the same catalysts and process conditions "[t]o effect ultra-deep HDS ..., the last compounds present, in particular a limited number of alkylated benzothiophenes, need to be removed ..., with the alkylbenzothiophenes which have the alkyl on the 4- or 6- position being particularly difficult to remove." (Specification 2:27-31). Accordingly, we find that Hatanaka and the claimed process employ the same catalysts and process conditions to effect the same reaction and remove the same undesired sulfur compounds to the same levels.

We find that Hatanaka teaches that the active metal content in a "conventional desulfurization catalyst" can be adopted as the active metal content contained in the catalyst of the first and second hydrogenation zones of the invention (Hatanaka 6:15-19). We further find that Hatanaka teaches that the catalyst should first be presulfided (Hatanaka 8:40; *see also*

Example 3).² Accordingly, we agree with the Examiner that one of ordinary skill in this art would have reasonably expected the sulfur-containing organic additives taught by the Takahashi references in conjunction with conventional desulfurization catalysts to achieve similar results when used in conjunction with the conventional desulfurization catalysts disclosed in the Hatanaka ultra-deep HDS process. Furthermore, we note that the specific desulfurization catalysts taught by the Takahashi references are inclusive of the desulfurization catalysts taught by Hatanaka. *See* Takahashi 4:23-32, where it is taught that the desulfurization catalyst activity is higher when used with a sulfur-containing organic additive. Additionally, the Takahashi references teach that the essential presulfiding step may be eliminated by use of this sulfur-containing organic additive, and thus these references would have suggested the use of this additive in the process of Hatanaka to eliminate the presulfiding step taught by Hatanaka. *See* Takahashi 1:50-53; 2:1-4; and EP '295 2:10-22 and 36-38; 3:24-40; and 9:5-12.

For the foregoing reasons and those stated in the Answer, we determine that the Examiner has established a *prima facie* case of obviousness in view of the reference evidence. Based on the totality of the record, including due consideration of Appellants' arguments, we determine that the preponderance of evidence weighs most heavily in favor of obviousness within the meaning of § 103(a). Therefore, we affirm the

² As taught by the three Takahashi references, presulfiding is essential to HDS processes to convert the inactive oxide of the metal catalyst component to the corresponding active sulfide before the hydrotreating reaction (e.g., EP '295 2:10-38).

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rejections of the claims on appeal under § 103(a) over Hatanaka in view of either Takahashi, EP '211, or EP '295.

The decision of the Examiner is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv)(2006).

AFFIRMED

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